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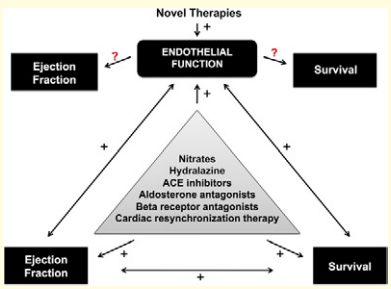
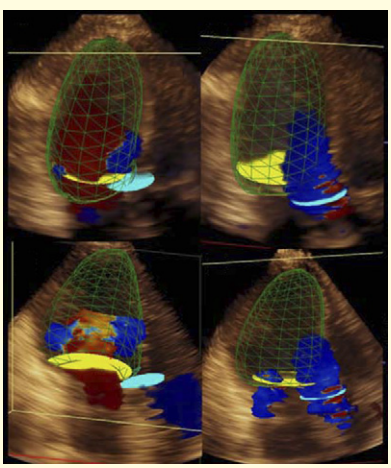
Inside This Issue

STATE-OF-THE-ART PAPERS





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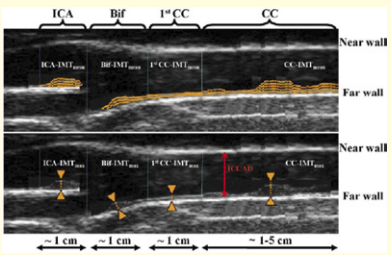
SPECIAL ARTICLE

Since its inception in 1997, the National Cardiovascular Data Registry (NCDR) has been the basis for the development of performance and quality metrics, site-level quality improvement programs, and peer-reviewed health outcomes research. The Data Quality Program (DQP) of the NCDR is tasked with ensuring the completeness, consistency, and accuracy of data submitted to the observational clinical registries. In this paper, Messenger and colleagues describe the activities of the DQP and report the participant average raw accuracy of data abstraction for the 3 main registries of the NCDR. They conclude that the 2,010 audits show that the NCDR accurately represent the data from the medical charts.

CLINICAL RESEARCH



Baldassarre and colleagues compared the performance of several measures of carotid intima-media thickness (C-IMT) alone, or in combination, as predictors of cardiovascular events (CVEs). Almost 4,000 subjects were followed for 3 years. The average of 8 maximal IMT measurements ($IMT_{mean-max}$), alone or combined with, the inter-adventitia common carotid artery diameter (ICCAD), classified events and nonevents better than the common carotid mean IMT. Adjusted Kaplan-Meier curves showed that an individual with an average Framingham Risk Score, and both $IMT_{mean-max}$ and ICCAD above the median, had a 6.5% risk to develop a CVE over 3 years compared to a 3.4% risk for those with the same FRS, and both $IMT_{mean-max}$ and ICCAD below the median.

Editorial Comment: Michiel L. Bots, Hester M. den Ruijter, p. 1500

(*continued on page A-22*)

CARDIOVASCULAR RISK

PPA Predicts Mortality Risk in Frail Elderly Patients **1503**

Athanase Benetos, Sylvie Gautier, Carlos Labat, Paolo Salvi, Filippo Valbusa, Francesca Marino, Olivier Toulza, Davide Agnoletti, Mauro Zamboni, Delphine Dubail, Patrick Manckoundia, Yves Rolland, Olivier Hanon, Christine Perret-Guillaume, Patrick Lacolley, Michel E. Safar, Francis Guillemin

The longitudinal PARTAGE study sought to determine the predictive value of blood pressure (BP) and pulse pressure amplification (PPA) measurements for predicting overall mortality and major cardiovascular (CV) events in subjects over 80 years of age living in nursing homes. During the 2-year follow-up, a 10% increase in PPA was associated with a 24% decrease in total mortality and a 17% decrease in major CV events. Systolic BP, diastolic BP, and PP were either not associated or inversely correlated with total mortality and major CV events.

CARDIOVASCULAR RISK

Subset of Monocytes Linked to Worse Cardiac Outcomes **1512**

Kyrill S. Rogacev, Bodo Cremers, Adam M. Zawada, Sarah Seiler, Nadine Binder, Philipp Ege, Gunnar Große-Dunker, Isabel Heisel, Florian Hornof, Jana Jeken, Niko M. Rebling, Christof Ulrich, Bruno Scheller, Michael Böhm, Danilo Fliser, Gunnar H. Heine

Rogacev and colleagues prospectively analyzed cardiovascular events in 951 subjects referred for elective coronary angiography. Patients were categorized according to quartiles of total monocyte and monocyte subset counts. In an univariate analysis, counts of total, classical (CD14++CD16−), and intermediate (CD14++CD16+) monocytes predicted the primary endpoint, while nonclassical monocytes did not. After full adjustment for confounders, CD14++CD16+ monocytes remained independently related to cardiovascular events (4th vs. 1st quartile: hazard ratio: 3.0). Future studies are needed to elucidate whether CD14++CD16+ monocytes should be targeted for new therapeutic strategies in atherosclerosis.

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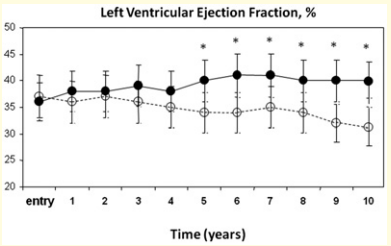

HEART FAILURE

Supervised ET Program Results in Long-Term Improvements in QOL and Cardiac Function **1521**

Romualdo Belardinelli, Demetrios Georgiou, Giovanni Cianci, Augusto Purcaro

Belardinelli and colleagues studied whether a long-term (10-year) supervised exercise training (ET) program would produce sustained improvements in functional capacity and quality of life (QOL) in chronic heart failure patients with systolic dysfunction. Subjects with ejection fraction (EF) <40% were randomized to ET at 60% of peak VO_2, 2 times a week or a nontrained group. In ET patients, peak VO_2 was above predicted VO_{2max} each year during the 10-year study, whereas it progressively decreased in the control population. QOL scores were significantly higher with ET, and ET patients also had lower rates of hospital readmission and cardiac mortality. This study shows remarkable and durable efficacy of ET for patients with systolic heart failure.

Editorial Comment: David J. Whellan, p. 1529

HEART FAILURE

Radiofrequency Ablation of Premature Ventricular Ectopy Improves the Efficacy of CRT in Nonresponders **1531**

Dhanunjaya Lakkireddy, Luigi Di Biase, Kay Ryschon, Mazda Biria, Vijay Swarup, Yeruva Madhu Reddy, Atul Verma, Sudharani Bommana, David Burkhardt, Raghuveer Dendi, Antonio Dello Russo, Michela Casella, Corrado Carbucicchio, Claudio Tondo, Buddhadeb Dawn, Andrea Natale

Lakkireddy and colleagues examined whether suppressing premature ventricular contractions (PVCs) using radiofrequency ablation would improve the effectiveness of cardiac resynchronization therapy (CRT) in nonresponders. A total of 65 CRT nonresponders with >10,000 PVCs in 24 h underwent PVC ablation. There were significant improvements in left ventricular (LV) ejection fraction and LV end-systolic volume. PVC ablation may enhance CRT efficacy in nonresponders with significant PVC burden, although a randomized trial is needed.

(continued on page A-25)

HEART FAILURE

Arnold J. Greenspon, Jasmine D. Patel, Edmund Lau, Jorge A. Ochoa, Daniel R. Frisch, Reginald T. Ho, Behzad B. Pavri, Steven M. Kurtz

Greenspon and colleagues analyzed a large national database to identify contemporary trends in pacemaker (PM) utilization in the United States. The Nationwide Inpatient Sample (NIS) was queried to identify PM implants between 1993 and 2009. During this time, overall utilization increased by 56%, with 47 implantations/100,000 persons in 1993 increasing to 62 implantations/100,000 persons in 2009. Patient age and Charlson Co-morbidity Index increased over time as did hospital charges. This study shows steady growth in the utilization of PMs in the United States with patients getting older and sicker.

CARDIAC IMAGING

Geraint Morton, Amedeo Chiribiri, Masaki Ishida, Shazia T. Hussain, Andreas Schuster, Andreas Indermuehle, Divaka Perera, Juhani Knuuti, Stacey Baker, Erik Hedström, Paul Schleyer, Michael O'Doherty, Sally Barrington, Eike Nagel

Absolute quantification of myocardial perfusion and myocardial perfusion reserve (MPR) using PET have proven diagnostic and prognostic roles in patients with CAD. Quantitative cardiovascular magnetic resonance (CMR) perfusion imaging has been established more recently, but has not been validated against PET in patients with CAD. A total of 41 patients with known or suspected CAD underwent quantitative 13N-ammonia PET and CMR perfusion imaging prior to coronary angiography. There was high correlation between CMR-derived MPR and PET-derived measurements, though absolute measurements correlated only weakly. Area under the receiver-operating characteristic curves for detecting CAD were similar for both techniques. These results confirm the value of CMR perfusion imaging, but further refinements are needed before the techniques can be used interchangeably for measuring absolute perfusion.

Editorial Comment: Bernhard L. Gerber, p. 1556

(continued on page A-26)

HYPERTENSION

Macheret and colleagues studied plasma levels of circulating atrial natriuretic peptide (ANP) and B-type natriuretic peptide (BNP) and their potential contribution to human hypertension. Compared to normotensive subjects, BNP_{1-32} and NT-$proBNP_{1-76}$ were significantly decreased in those with pre-hypertension, and BNP_{1-32} was significantly decreased in stage 1 hypertension as well. NT-ANP_{1-98} was also lower in subjects with pre-hypertension. These results suggest impaired production and/or release of $proBNP_{1-108}$ along with a concomitant reduction of BNP_{1-32} and NT-$proBNP_{1-76}$ in the early stages of hypertension.

GENETICS AND GENOMICS

Mann and colleagues studied a variant in the *SCN5A* gene, which encodes the alpha-subunit of the cardiac sodium channel, that was identified in 1 large kindred with dilated cardiomyopathy (DCM) and multiple arrhythmias. Patch-clamp studies showed that the variant, R222Q, produced current responses of earlier onset and greater magnitude than wild-type channels. Action potential modeling suggested that rate-dependent ectopy of Purkinje fiber origin is the predominant ventricular effect of the R222Q variant. In R222Q carriers, premature ventricular contractions and DCM were substantially reduced by sodium channel-blocking drugs. The R222Q *SCN5A* variant has an activating effect on sodium channel function and is associated with reversible ventricular ectopy and DCM.